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Homeland Security

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# Crew Endurance Management Newsletter

*an information resource about the Crew Endurance Management System (CEMS) for its practitioners and those interested in learning more about it*

## Crew Endurance Resources

Welcome to the Crew Endurance Newsletter. We continue to keep you current on sleep and endurance-related information to support your personal knowledge of Crew Endurance Management and implementation.

**READER INTERFACE NOTE:**
When reading on the Internet, the symbol to the right indicates a hyperlink for the subject matter indicated in blue, underlined text. Readers with printed copies can visit our website for more information:
http://www.uscg.mil/hq/g-m/cems/index.htm

Much of the information in this issue was originally printed in the National Sleep Foundation's weekly *Alert* – if you'd like to receive this information regularly, sign up with them here – it's free!

Please be sure to pass this information along to others so that they can register with us.

## This Issue:



## Risk Factor Spotlight: No Opportunity for Exercise

*by LT Vivianne Louie*

In our last issue, we discussed how *High Workload* and its related *High Stress* negatively affect endurance. In this issue, we will explore a factor that can reduce such stress and the risks that come with it: *Exercise*. For a review of all 15 Crew Endurance Risk Factors, please see the following link to the Decision Support Worksheet:

Crew Endurance Risk Factors

### Why Exercise?

Exercise is so beneficial to us on so many levels that the very lack of it creates a risk of reduced endurance. What other single thing can simultaneously …

- Reduce your risk of death from heart disease
- Reduce your risk of developing diabetes, high blood pressure, or colon cancer
- Reduce your risk of dying prematurely
- Reduce your blood pressure
- Help control your weight
- Help you build and maintain healthy bones, muscles, and joints
- Help improve your mood and lift depression
- Enhance your cognitive thinking
- Help you fall asleep and sleep better throughout your entire sleep period
- Reduce stress?

Regular exercise will do *all* of these things while building your endurance!

### Exercise Helps You Physically

Regular exercise helps you gain strength and aerobic endurance, making you more physically fit to handle tasks. With better physical endurance, you can better sustain the ill effects of extreme climates, ship motion, and ship vibration.

There are many scholarly studies that link exercise and positive benefits for people of all sizes and ages. One University of Miami study found that regular exercise helped strengthen the immune system, proving that even if you're already healthy, exercise will help you stay that way, even when under stress.

Exercise also helps your body to get the rest it needs. Regular exercise helps you to fall asleep faster, and to sleep more soundly throughout the night. Studies also show that it helps to reset your biological clock and adapt to a new circadian rhythm, which can be especially important to crewmembers transitioning between a day and night shift.

### Exercise Helps You Mentally

As mentioned, exercise helps to relieve stress. Any exercise will benefit you if it contributes to your feeling of control, confidence, effectiveness, and mastery over life.

Research shows that physical activity enhances cognitive thinking. According

to a University of Georgia study, aerobic exercise facilitated information processing and increased decision-making speed. In addition, exercise is known to enhance memory, problem-solving ability, concentration, alertness, and productivity.

**Easier Said Than Done?**

Exercise is probably the last thing you want to do at the end of a long, tiring shift. Or you may be perfectly willing, but your vessel has no equipment or facilities, or may not allow you enough time. Don't worry, your friendly "Newsletter Coach" is ready for all your excuses! Remember that CEMS is a continuous improvement process, so any activity beyond your usual routine will work to your advantage.

*"I'm too tired to exercise at the end of my shift!"*

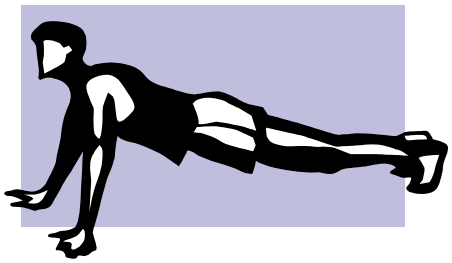
You may already have a physically demanding job. Even so, when timed right, exercise can actually give you *more* energy to help you get through your day. You might want to discuss your activity level with a CEMS coach to help you determine what amount and level of exercise to take on – perhaps they can recommend some aerobic or strength training to help you do your work even more efficiently.

Generally, those working during the day will benefit from after-work exercise completed no later than one hour before bedtime. Those working a night shift will benefit more by doing exercise before work, allowing them to head right to sleep after their shift.

*"There's no equipment!"*

All you have to do here is look in the mirror! Besides walking or jogging around the deck (if it's not too crowded with equipment or cargo), there's always good old-fashioned calisthenics like jumping jacks, push-ups, pull-ups, and sit-ups. Though not as fancy or fashionable as the latest treadmills or elliptical trainers out there, these exercises do the job in getting your heart rate up and getting the blood moving about your body. Calisthenics and any other aerobic exercise will enhance oxygen delivery to your muscles, helping your body to function more efficiently both physically and mentally. Strength training helps burn fat and build muscles, which will help you do physical tasks more efficiently.

You can also request that your CEMS coach or Crew Endurance Work Group look into the lack of equipment. As a result, some companies have either purchased equipment or at least allowed crewmembers to bring their own aboard.



*"There's no opportunity to exercise!"*

In this case, you'll just have to *make* the opportunities. Start out by not walking the shortest distance between starting and destination points. Climb steps or ladders for short periods to work in some exercise. Do squats or calf raises while brushing your teeth. Try to set a small daily goal to start with and build up from there … you'll soon find exercise to be addictive, and you'll be finding ways to add more in no time! Even if you feel tired to start with, you will become more energized. You may even feel better simply knowing that you're doing something good for yourself.

**One Step at a Time**

If you haven't been active recently, remember to take it easy at first. Remember the moral of the story of the tortoise and the hare: *slow and steady wins the race*. You wouldn't jump into the deep end of the pool if you didn't know how to swim, right? In the same spirit, don't try to run a 7-minute mile or do 200 crunches in a row your first few days or weeks exercising.

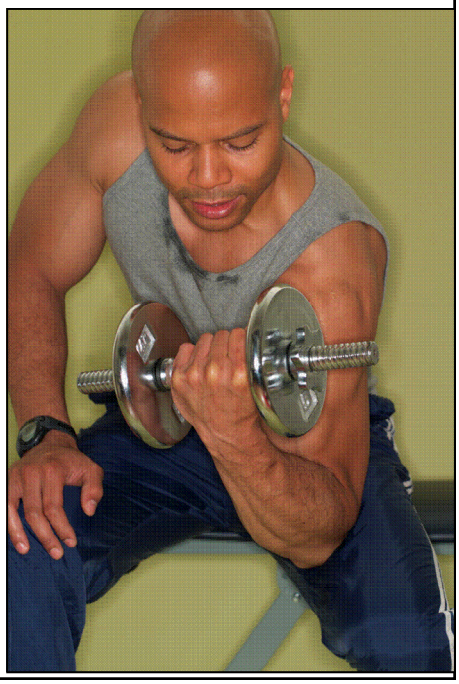
**Ready, Set, GO!**

How should you get started? Seeing your doctor for advice would be the safest way to start, especially if you currently have health problems. However, if you're in decent health, you can probably just start by assessing your current fitness level and boosting it in small steps. For example, do you get winded climbing two flights of stairs? Start with some aerobic activity and build up your endurance. Do you find that your physical tasks wear you out by the end of the day? Start doing some push-ups or using resistance bands or weights to build up your arm strength.

Just by doing a random Internet search, you can find any number of free exercise sites, publications, and articles promoting various physical fitness programs. Take advantage of them and your body will thank you for it! You can start with some of the Department of Health and Human Service's offerings at the sites below.

www.fitness.gov

www.healthierus.gov



# CEMS in the Maritime Industry/Accident Prevention

## NTSB Links Sleep Deficit to Ferry Accident

As discussed in previous newsletters, when crewmembers fragment their sleep into two or more shorter periods (and so do not obtain 7-9 hours of *uninterrupted* sleep), the risk of fatigue-related vessel accidents can increase.

In a related case, the National Transportation Safety Board (NTSB) recently concluded that fatigue played a role in the grounding of the U.S. passenger vessel *LeConte*. The grounding resulted in a 40-foot-long by 1-foot-wide tear in the hull on each side of the keel, causing substantial flooding and over $3,000,000 in property damage.

The May 10, 2004 grounding occurred on Cozian Reef, a well-marked navigation hazard about 30 miles north of Sitka, Alaska. According to the report, the *LeConte's* navigation watch was "attempting to navigate an alternative route that was more scenic" when it encountered the tug *Western Mariner* towing a freight barge. No passing signals were exchanged. As a result, the chief mate and master made a series of assumptions, estimations, and choices resulting in the grounding.

The NTSB report stated, "the probable cause of the grounding of the *LeConte* was the failure of the master and the chief mate, who was conning the vessel, to recognize that the course selected by the chief mate would cause the vessel to pass on the wrong side of the navigation daymark mark for Cozian Reef and to pass over the reef."

According to the report, the chief mate conning the ferry had a significant sleep deficit because of work performed off-watch, while standing a 6-hour watch regimen. The master's 96-hour work/rest history indicated that he had obtained more rest than the chief mate, but that his rest periods were numerous and brief (amounting to periods no longer than four hours) because of the need to be on the bridge during arrivals and departures of the vessel.

This is just one further example of how insufficient sleep duration or poor quality of sleep erodes situational awareness and contributes to accidents.

Click here to read the NTSB marine accident brief:

**NTSB Brief: *LeConte* Grounding**

# CEMS and Accident Prevention

## Lack of Sleep May Have Same Effect on Doctors as Drinking Three or Four Cocktails

(Originally from the Sept. 13, 2005 *NSF Alert*)

*This study has particular significance to the maritime industry, since mariners routinely work 84-hour work weeks for 28 days straight, with a maximum of six hours for rest at a time on a 6/6 watch schedule:*

A study led by J. Todd Arnedt of the University of Michigan found that an 80-hour work week can be just as dangerous as three or four drinks to doctors who must drive or perform mentally taxing activities after their shifts.

The researchers tested 34 doctors by measuring their performance on an attention test and a driving simulator on four different occasions. The doctors were either measured after a rotation of day shifts (with few evening shifts) or after a rotation of intense evening shifts adding up to an 80-hour work week. During the final week of the rotation, the volunteers were either given alcoholic beverages or non-alcoholic placebos.

The results showed that doctors who had worked a heavy schedule of night shifts experienced 7% slower reaction times than those doctors who primarily held day shifts. When it came to simulated driving, doctors who worked many night shifts performed similarly to those doctors with an easier schedule whose blood alcohol level was just below the legal limit.

The authors concluded that "residents must be aware of post-call performance impairment and the potential risk to personal and patient safety. There should be sleep loss, fatigue, and countermeasure education in residency programs. Additional studies should examine the impact of these operational and educational interventions on resident driving safety and on patient care and safety."

**Learn more:**

- Read the abstract
- Learn about drowsy driving
- Check out "More Sleep Equals Fewer Mistakes for Hospital Interns" in NSF's ***sleep****matters*

# CEMS and Accident Prevention

## Treating the Ills of Shift Work: A Randomized, Controlled Study of Modafinil

(Originally from the Aug. 9, 2005 *NSF Alert*)

*As a nation, we've come to rely on science to provide more and more answers for the problems we face. Though helpful in many cases, science alone doesn't always have all the answers. Many people would like to take a pill to sleep better, or stay awake, or even to lose weight. Unfortunately, as described in the following NSF Alert article, a pill doesn't completely solve a very complex problem – dealing with the effects of shift work:*

Nearly six million Americans work at night on a permanent or rotating basis. Many are in fields that place a premium on alertness, such as healthcare, police work, transportation, and energy.

Because of misalignment between the internal circadian regulation and actual sleep-wake schedules, night shift work disrupts both the sleep that occurs during the daytime and the alertness that is required on the job at night. Shift workers are at increased risk for peptic ulcers, coronary heart disease, insulin resistance, and metabolic syndrome, and they are also at risk for sleep deprivation, depression, accidents related to sleepiness, and curtailed family and social activities. For approximately 5-10% of shift workers, the ordeal is even more extreme, resulting in *shift work sleep disorder* (SWSD), a condition that includes a primary complaint of insomnia or excessive sleepiness to such an extent that it is difficult for the person to function effectively.

In the August 4, 2005 issue of the *New England Journal of Medicine*, a study by Charles Czeisler and colleagues tested 209 patients diagnosed with SWSD to determine whether use of the prescription drug modafinil would reduce shift worker sleepiness on the job and during the commute to and from work. The study (the first randomized, placebo-controlled investigation of SWSD) used objective and subjective measures of sleepiness and alertness, including the Multiple Sleep Latency Test and the Psychomotor Vigilance Test.

The study found that modafinil did indeed improve measures of sleepiness both on the job and during the commute (reducing reported accidents or near accidents by half), but "despite these benefits, patients treated with modafinil (before the start of their shifts) continued to have high levels of sleepiness and impaired performance at night." The authors concluded, "although modafinil improves the measured levels of performance, it is far from what is needed for these patients to function at a normal level."

An editorial accompanying the modafinil study challenged the study design as too limited to generalize about the clinical value of modafinil since many factors are associated with SWSD, there are alternative intervention and treatment options, and the effect on other outcomes besides sleepiness should be considered. The study, the authors, and the editorial all agree that more needs to be done to address the ills and dangers — to self and others — associated with shift work. This suggests the need to consider the supports employees require for shift work, including screening for sleep disorders, health assessment, environmental and scheduling interventions, napping arrangements, transportation to and from work, family counseling, and other means to reduce the vulnerability of this population.

As seen in many examples like this study, managing your endurance is a complex balancing act, requiring you to address many factors and implement multitudes of partial solutions to come to better situations.

- Read the abstract
- Read the editorial
- Read about shift work in NSF's Sleeptionary™
- Get NSF's recently updated "Strategies for Shift Workers"

# CEMS and Your Health

## Keep Yourself Healthy (and Rested) When You're Working Long Hours

(Originally from the Aug. 30, 2005 *NSF Alert*)

The pile of data on the effects of fatigue on workers' health just keeps getting bigger. We know that it's easy to fall into unhealthy patterns when you're working long hours, but, really, how bad can a 50-hour work week be?

A study published in *Occupational and Environmental Medicine* found that 12-hour workdays can lead to serious illness. In fact, for individuals who work 12-hour workdays or longer, the risk of becoming sick increased by 37 percent, researchers found.

If your long workdays are unavoidable, here are some strategies from the Institution of Occupational Safety and Health, the International Stress Management Association UK, and the British Dietetic Association for staying healthy. Few of these strategies will be new to our regular CEMS newsletter readers!

**TO COMBAT SLEEP PROBLEMS AND FATIGUE:**

- Set aside time at night to relax and clear your head so your work doesn't follow you home.
- When working long hours, take a mid-afternoon break, go for a walk, or take a ten-minute nap.

**TO PREVENT MUSCULOSKELETAL DAMAGE:**

- If you work at a computer or use machinery, make sure you take breaks.
- Frequently adjust your seat, computer screen, and posture.

**TO AVOID BECOMING STRESSED:**

- Schedule a relaxing activity every day. Make time for reading, warm baths, listening to music, or exercising.

**TO STEER CLEAR OF A POOR DIET:**

- Make time for lunch.
- Bring healthy snacks to work and eat plenty of fruits and vegetables.

*More information:*

- Check out the *Occupational and Environmental Medicine* abstract
- Read the *Daily Telegraph* story
- Get NSF's Healthy Sleep Tips

# CEMS and Your Health

## Help for Sleep Apnea

(Originally from the July 5, 2005 and Aug. 2, 2005 issues of *NSF Alert*)

As mentioned in our last issue , obstructive sleep apnea (OSA) is a disorder in which breathing is briefly and repeatedly interrupted during sleep. Sleep apnea can result in problems such as hypertension, heart disease, and mood and memory problems. In addition to these health problems, OSA also increases the risk of driving accidents, hindered productivity, and strained relationships.

The National Sleep Foundation's 2005 *Sleep in America* poll was based on a three-part questionnaire designed to evaluate individuals' snoring and sleep habits, daytime sleepiness, and body mass index (BMI), in addition to other factors. The poll found that approximately one-fourth (26%) of America's adults were at risk for obstructive sleep apnea (OSA), and 8% of respondents experienced or had been observed having pauses in their breathing during sleep at least three nights per week.

The *Sleep in America* poll also found links among lifestyles, other medical conditions, and the risk for sleep apnea. For example, the poll respondents who missed work or made errors at work at least one day in the past three months were more likely to be at risk for sleep apnea (39%). Those who were considered obese or overweight were more likely to be at risk for sleep apnea (57%) than those who were average or underweight (10%).

According to the National Institutes of Health, it's estimated that more than 12 million Americans have obstructive sleep apnea. **Because OSA can be life-threatening, you should consult your doctor immediately if you feel you may suffer from it.**

And you don't have to struggle with sleep apnea alone: the American Sleep Apnea Association has a new online support forum where you can learn about sleep apnea and exchange thoughts, ideas, and support with others — 24/7! Check it out now and learn more about sleep apnea.

## The Buzz on Decaffeinated Coffee

(Originally from the Aug. 2, 2005 *NSF Alert*)

Many people who drink coffee switch to decaffeinated after lunch so the caffeine won't interfere with their sleep. Or they may switch completely to decaf to avoid the stimulating effects of caffeine. Despite these conscious efforts, decaf drinkers may not be doing themselves much good.

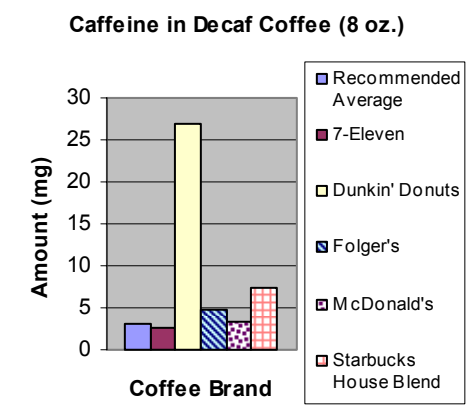
The latest news on decaffeinated coffee is enough to keep you up at night -- literally! A report by Liz Crenshaw of NBC4 in Washington, DC, found that caffeine content is often unregulated in decaf coffee, so you may be getting an unexpected buzz. Crenshaw purchased decaf coffee at four stores — Dunkin' Donuts, 7-Eleven, Starbucks, and McDonalds — and also brewed a pot of Folgers decaf coffee. She then sent samples of the coffee to Krueger Laboratories in Cambridge, MA, an independent testing lab.

The FDA states that to be labeled a "decaffeinated" product, coffee must have 97 percent of its caffeine removed. The National Coffee Association (NCA) similarly agrees that a cup of coffee should average about three milligrams of caffeine per eight ounces of coffee. Crenshaw found the results of the experiment were quite different from the regulations: four out of the five brands of coffee tested contained more caffeine than the NCA's recommended three milligrams.

Regardless of where you buy your cup of decaf, the results indicate that caffeine content in decaffeinated coffee is highly variable and often unregulated. These variations can cause problems for individuals who think they're drinking coffee minus the caffeine, since it can have a stimulating effect for as long as six hours after consumption. So be careful if you're drinking decaf coffee close to bedtime – you might be in for a rude awakening!

***Before you brew your next cup …***

- Read NSF's Sleeptionary on caffeine
- Use NSF's Caffeine Calculator to determine your caffeine intake




## NSF Presents 3-D Animated Educational Sleep Tool

(Originally from the Sept. 21, 2005 *NSF Alert*)

The National Sleep Foundation would like to introduce you to the Doze family in their new, easy-to-use, educational online multimedia tool. "Cycles of Sleeping and Waking with the Doze Family" illustrates the sleep experience and all that hinders it!

While watching the three-generation (adolescent, adult, and older adult) Doze family, a control panel appears on the screen, enabling users to learn about and monitor several factors associated with sleep. Each control panel option provides more information about how it works, and the main menu allows the user to jump around and pick out the information that he or she is most interested in.

The tool also examines how different variables such as shift work, caffeine, alcohol, stress, and "Monday morning blues" can affect sleep. You can see how each family member's sleep is impacted by daily routine, lifestyle, and age. For example, you can watch the mother struggle to stay awake during her night shift as a nurse, or see how her daughter is affected by staying up too late on the weekend.

Whether you know a great deal about sleep and the factors affecting it or not, the Dozes have something to offer you. Check out this interactive 3-D educational tool on the web:
www.sleepfoundation.org/doze

# CEMS in Other Transportation

## Naps Prove Helpful for Sleep-Deprived Astronauts

(Originally from the June 14, 2005 *NSF Alert*)

Despite all the studies and articles (including those in Vol. I, #1 and Vol. II, #1 ) demonstrating how important getting eight hours of quality sleep is, we all know that being in a strange place or being under stress can keep us from getting our needed sleep no matter how tired we are.

Such is the case for astronauts. According to NASA, "Despite NASA recommendations that astronauts sleep eight hours a day, they usually don't. Strange sights and sounds, the stress of riding a powerful rocket, the lack of a normal day-night cycle — all these things tend to keep space travelers awake. Studies show that astronauts typically sleep 0.5 to 2.5 hours less than they do on Earth."

**In the end, there's no substitute for eight sweet hours of shut-eye.**

A recent series of experiments led by David Dinges, Ph.D., funded by NASA in cooperation with the National Space Biomedical Research Institute, examined napping strategies for astronauts. Ninety-one volunteers spent ten days living on one of 18 different sleep schedules, all in a laboratory setting. Each volunteer got four to eight hours of continuous "anchor" sleep, plus a daily nap of less than 2.5 hours.

The study found that longer naps were more effective, and some cognitive functions benefited more from napping than others: "To our amazement, working memory performance benefited from the naps, [but] vigilance and basic alertness did not benefit very much," said Dinges. They also found that participants on a nocturnal schedule felt more "sleep inertia" when waking up from a nap.

Dinges and fellow researchers are now working on pulling the data together to discover the best napping schedule for astronauts and other people in challenging sleep environments. This could help doctors prescribe naps of the right time and duration for drowsy people in high-risk professions.

Such a program is still in the future. Meanwhile, Dinges noted another finding of their study: while beneficial, naps are a short-term fix, offering only temporary boosts in mental acuity. "They cannot replace adequate recovery sleep over many days," he said. Or, as summarized in the full story below, "In the end, there's no substitute for eight sweet hours of shut-eye."

Read the full story here:

http://science.nasa.gov/headlines/y2005/03jun_naps.htm

## Crew Endurance Resources Online

The **Coast Guard CEMS Website** continues to be updated with additional CEM information and resources. Thoughts and suggestions are always welcome regarding content and information. Please forward them to: **fldr-GMSE@comdt.uscg.mil** or call us at 202-267-2997.

# CEMS Updates

## SOCP Launches New CEMS Computer-Based Training Video

Whether you're already implementing CEMS or not, chances are there are many members of companies and crews out there who would like to learn more about it without reading hundreds of pages of material.

Now there's a new computer-based training module that helps you do just that. The Ship Operations Cooperative Program (SOCP), operating in conjunction with the U.S. Coast Guard and Seagull AS, has produced a new self-directed interactive multimedia course on CEMS. The content is delivered through sound, illustration, animation, and informative text. A multiple choice learning assessment is carried out at the end of the course. A final report indicates how much training has been completed, the length of time spent, and the final assessment score.

Like other titles in Seagull's Onboard Library, this CD can serve as "a classroom at your fingertips" to help you learn about options and opportunities to manage your endurance levels. This would be a great tool to educate company and crewmembers about CEMS to help obtain buy-in and vertical alignment throughout your operation.

The CD is available through SOCP at a cost of $20 for SOCP members, $100 for non-members.

## Experts Training

**Our next Experts Training is scheduled for Spring 2006 Dates and location TBD**

Please contact **LT Vivianne Louie** (202.267.0173) if interested and she will notify you when the details have been finalized.

## Crew Endurance Management Newsletter

*an information resource about the Crew Endurance Management System (CEMS) for its practitioners and those interested in learning more about it*

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## Updated Website!

The **CEMS Website** has been recently updated. Be sure to look for these new tools and resources!

- **The *Guide for Maritime Operations ADDENDUM*** (please see description to your right)
- **Self-Sustaining Workshop:** Computer software that enables trainers and operators alike to learn the basics of CEM in an interactive, self-paced style - the encyclopedia of CEMS. Distributed to all members attending Crew Endurance Coaches Training, it is designed to help Crew Endurance Coaches with education efforts within their vessels and companies.
- **Decision Support Software:** Implementation tool that enables maritime operators to assess 15 Crew Endurance Risk Factors and subsequently develop crew endurance plans to address those areas needing improvement.

## Check Out Our New Addendum to the *Guide for Maritime Operations*!

The original *Crew Endurance Management Practices: A Guide for Maritime Operations* explained the Crew Endurance Management System (CEMS) and the scientific research behind its tools and practices. Since its publication in 2003, participation and interest in CEMS has grown exponentially.

Based upon feedback from the marine industry and experience assisting companies and trained coaches, the Coast Guard has identified a number of areas in which additional information could improve program implementation and overall understanding.

This addendum aims to supplement the original Guide for Maritime Operations in a step-by-step format. All mariners, from trained CEM Coaches to those reading about the system for the first time, can use the addendum to better understand its philosophy and the steps that all companies, regardless of their resources, can use to get started.

- ***Section I*** discusses the philosophy behind CEMS, explaining that while any interested company may implement the program, it should do so in a systematic way.
- ***Section II*** describes the cyclical five-step process recommended to implement CEMS.
- ***Section III*** guides readers, step-by-step, through the process, providing job aids and recommendations for companies and crewmembers at each stage of implementation.
- ***Appendices*** supplement the checklists by providing detailed information on endurance risk factors, light management, schedule changes, and recommendations for improvement in these areas.

**Get it right here:**